

## Remarks

Applicants would like to thank the Office for allowing claims 23 to 25 and acknowledging the allowability of claims 16 and 22.

### **35 USC 102(b) Rejections**

On page 2, the Examiner rejects claim 26 under 35 U.S.C. 102(b) as being anticipated by US 5,717,132 (Watanabe et al., hereinafter "Watanabe").

Watanabe is said to disclose a cantilever assembly in Figure 10. The Office notes here a cantilever (CA1) having a cantilever tip (3P). The cantilever is said to have a back side on top of cantilever and a front side on the bottom side, tip side. The Office expressed the opinion that (19) constituted a rigid support and that Watanabe's cantilever comprises a step-like portion on its front side near where the cantilever is attached to the support.

The Office identifies Watanabe "movable arm" (19) as a rigid support. Applicants respectfully submit that a movable arm is not a rigid support. In addition, Watanabe's movable arm 19 is not part of his cantilever assembly as required by the claim, but part of a fixture to releasably hold the cantilever assembly when in use. In particular, the cantilever assembly of Watanabe is, in Figure 10, pressed by a spring (which is arranged between said movable arm 19 and an insulator substrate 9 mounted on the cantilever back side) on a piezoelectric substrate 15.

If parallels can be drawn at all between the present invention and Watanabe, the Si layer 2 in Watanabe's cantilever assembly of Figure 10 may be said to correspond to the rigid support of claim 26. However, this layer is provided towards the front rather than the back side of the cantilever CA1 and does not provide a step-like portion according to claim 26: The only step-like portion on the front side is the step between

the cantilever and the Si-support and is not part of the cantilever as claimed.

For at least the reasons stated above, claim 26 is not anticipated by Watanabe.

### **35 USC 103(a) Rejections**

On page 3, the Office rejected claims 10 to 13, 17 and 21 under 35 U.S.C. 103(a) as being unpatentable over US Patent 5,265,863 to Kajimura et al. (hereinafter "Kajimura") in view of "Small Cantilevers for Force Spectroscopy of Single Molecules" by Viani et al. (hereinafter "Viani").

The Office acknowledged that Kajimura fails to disclose a cantilever or an area of high reflectance material of the size claimed.

However, Viani is said to disclose a process whereby small rectangular cantilevers are fabricated from silicon nitride. The cantilevers fabricated are said to have a length of 9-50 micrometers and metallic reflector pads have been added to the cantilever ends to maximize reflectivity. Although Viani is said to fail to expressly disclose the size of the reflector pad, the Office expressed the opinion that with a cantilever having a length of nine micrometers, naturally, the reflector pad would have an area of reflectance less than ten micrometers. Finally, the Office concluded that providing a "small" cantilever would have been obvious to one of ordinary skill in the art because it is well known in the art that small cantilevers have higher resonant frequencies than larger cantilevers, while simultaneously providing the same spring constants.

Applicants previously argued that the teaching of Kajimura, who discloses regular sized cantilevers with a reflective area at the back side facing away from the sample could not be readily combined with the small size cantilever of Viani in which a reflector pad is provided on the front side facing towards the sample to be scanned.

Applicants noted that providing a reflective area on the back side of the cantilever results in serious problems as the size of the cantilever decreases and referred to page 2, last full paragraph and the paragraph bridging pages 2 and 3 of the present disclosure.

Thus, applicants argued that if a person skilled in the art would combine the two references at all, such a person would provide the reflective area on the front in accordance with the teaching of Viani (and the general set up known from small size cantilevers).

The Office found applicants' argument not persuasive and explained starting on page 8 that the Office's argument did not combine the teachings of Kajimura and Viani to arrive at the present invention, but that the Viani article was only provided to show that silicon nitride cantilevers can be made to have a length between one and one hundred micrometers.

In particular, the Office stated that Kajimura sets forth the basic structure of the cantilever assembly save for the length of the cantilever, while Viani is used to only show that silicon cantilevers, the same as used in Kajimura, may be made much smaller in length.

Applicants respectfully submit that this argument does not address the problems noted on pages 2 and 3 of the present specification. The Office has provided no evidence that would question applicants' discussion in the specification.

Applicants notes that "it is incumbent upon the Patent Office, whenever a rejection on this basis is made, to explain *why* it doubts the truth or accuracy of any statement in a supporting disclosure and to back up assertions of its own with acceptable evidence or reasoning which is inconsistent with the contested statement. Otherwise, there would be no need for the applicant to go to the trouble and expense of supporting his presumptively accurate disclosure." *In re Marzocchi*, 439 F.2d 220, 224, 169 USPQ

The Office seems also to question whether Viani does indeed disclose that his reflection pad is provided at the front side of the cantilever.

For this the Office is directed at Viani's Figure 1, in particular 1d) and the respective discussion of page 2259.

Applicants note that for cantilevers of the size of Kajimura it is quite easy to fabricate the reflective pad at the cantilever back side opposing the cantilever front (tip) side. However, forming useful cantilevers of significant shorter length (such as between  $1\mu\text{m}$  and  $10\mu\text{m}$ ) is not just a scaling down procedure, but necessitates complex fabrication processes such as the one disclosed in Viani, see, e.g., Viani's Figure 1 and the respective description. As can be seen, the reflector pad has to necessarily be formed on the cantilever front side when using Viani's process of manufacturing his short atomic force microscope probe cantilever. This small cantilever is formed together with its support from a one-piece monocrystalline silicon wafer (Fig. 1a) by conducting appropriate etching steps. Figure 1c shows the result before forming the reflector pad. In this process step the cantilever is fully backed-up at its back side by the main wafer layer, so that there is no possibility at all to form the reflector pad at the cantilever back side. Instead it has to be necessarily formed on the cantilever front side as shown in Figure 1(d).

Thus, Viani does not just teach to fabricate cantilevers smaller in length than those of Kajimura, but also a change of the position of the reflector pad from the back side of the cantilever to its front side. This is because the scaling down of the total cantilever length that Viani performs does, as set forth above, not longer allow to use the typical reflector location/manufacturing techniques of Kajimura. Consequently, the area of high reflectance material is formed on the front side rather than the back side when cantilevers of smaller length are produced such as the one of Viani. There is no

teaching in Kajimura or Viani that and how a reflector pad of appropriately smaller size could or should be maintained on the cantilever back side. Maintaining the size of the reflector pad used in Kajimura is not an opinion since this would result in reflector pads approximately of the same length as the cantilever what interferes with quality. Reflector pads of the appropriately smaller size can, on the other hand, not be produced using typical techniques such as those described in Kajimura. Viani avoids this problem by using a different process for producing the reflector pad which includes placing it on the front side.

Applicants respectfully submit that the above shows that the combination of Kajimura and Viani does not render claims 10 to 13, 17 and 21 obvious. In particular, Kajimura and in particular the Viani article "must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention" (MPEP § 2143.03(VI)).

**On page 4**, the Office rejected claims 14, 15 and 20 under 35 U.S.C. 103(a) as being unpatentable over Kajimura in view of Viani as applied to claim 10 above, and further in view of US 5,319,961 (Matsuyama et al., hereinafter "Matsuyama").

The Office acknowledged that the combination of Kajimura and Viani fails to disclose that the support is provided with a sharp edge that is located a distance from a back side of the cantilever tip, the distance being determined such that during application of the reflectance material the area on the back side of the cantilever tip and the sloping boundary are formed or a support having at least two steps and wherein the edge of the second step does not obstruct application of the high reflectance material.

However, the Office expressed the opinion that Matsuyama provides the missing disclosure. The Office refers in particular to Matsuyama's Figure 2J.

Applicants note that Matsuyama fails to disclose any partial coating of a cantilever side to form a corresponding area of high reflectance material. In particular, Figure 2J does not show any reflective area at all. The passages cited by the Office only note that displacement of the cantilever may be measured optically, a fact also disclosed by Kajimura and Viani.

Applicants respectfully submit that the above shows that the combination of Kajimura, Viani and Matsuyama does not render claims 14, 15 and 20 obvious. In particular, applicants could show that the teachings of Matsuyama do not provide the disclosure for which it was cited.

**On page 5**, the Office rejected claims 18 under 35 U.S.C. 103(a) as being unpatentable over Kajimura in view Viani as applied to claim 10 above and further in view of US Patent 5,653,912 to Matsuyama et al. (Matsuyama '912).

The Office acknowledged that the combination of Kajimura in view of Viani fail to disclose that the recessed part of the support is partly-octagonal, but submits that Matsuyama '912 provides the missing disclosure-(irregular hexagon).

Claim 18 is indirectly dependent on claim 10, whose non-obviousness has been discussed above. Applicants submit that claim 18 is patentable for the reasons stated above in context of amended claim 10.

**On page 6**, the Office rejects claim 19 under 35 U.S.C. 103(a) as being unpatentable over Kajimura in view of Viani as applied to claim 10 above, and further in view of US 6,365,895 (Yamamoto). **On page 7**, the Office also rejects claim 19 under 35 U.S.C. 103(a) as being unpatentable over Kajimura in view of Viani as applied to claim 10 above, and further in view of Watanabe.

Claim 19 is indirectly dependent on claim 10, whose non-obviousness has been discussed above. Applicants submit that claim 19 is patentable for the reasons stated above in context of amended claim 10.

**On page 8**, the Office rejects claim 27 under 35 U.S.C. 103(a) as being unpatentable over US Watanable in view of Kajimura.

Claim 27 is dependent on claim 26. The deficiencies of Watanable have been discussed above. Applicants respectfully submits that Kajimura does not cure these deficiencies.

Applicants respectfully submit that the above shows that all remaining rejected claims are patentable over the art cited. An early issuance of a notice of allowance is respectfully requested. If any issue remains, the Office is urged to call the undersigned at 301-657-1282 for a speedy resolution.

The Commissioner is authorized to charge any fee deficiencies and overpayments to deposit account number 50-3135.

Respectfully submitted,

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